Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Oct 2016

Project Reference Number

NIA_NPG_012

Project Registration

Project Title

Improving Demand Forecasting

Project Reference Number

NIA_NPG_012

Project Licensee(s)

Northern Powergrid

Project Start

October 2016

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Melissa MacLennan, tel. 01977 605927

Project Budget

£120,000.00

Summary

The scope of this project includes enhancements to the desktop load forecasting model that Element Energy previously developed for Northern Powergrid, along with a suite of new desktop modelling tools, to provide more accurate technology uptake and load forecasting for GSP, primary and secondary substations across the Northern Powergrid licence areas.

While the scope of this project will include the provision of consistent low carbon technology uptake forecasts to Northern Powergrid's broader business planning and operations systems, changes to the fundamental approach and functionality of these other systems are out of scope.

Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

Problem Being Solved

At present, a range of different planning tools and datasets are used to generate future low carbon technology (LCT) load scenarios for various distribution network planning and operations functions including: connections forecasting, system planning, design planning and units forecasting. With ongoing changes to the policy landscape, economy, technology costs and customer behaviour, these planning tools require regular updates to ensure they remain accurate.

Similarly, there are learnings and large datasets from various network innovation projects that need to be integrated into these tools in a coherent and appropriately aligned manner across the various planning systems. For example, there are now many large datasets available on the consumption behaviour of various customer types (e.g. from numerous smart meter and customer monitoring trial datasets) as well as the performance and implications for distribution networks of various low carbon technologies (e.g. electric vehicles, heat pumps, distributed generation, etc.) and customer interventions (e.g. time-of-use tariffs, direct control and other demand-side response arrangements).

With the increasing complexity and amount of data required to capture these changes and learnings, an innovative new approach to

the generation of LCT uptake scenarios is required. The new approach must be able to ensure that the latest data and innovation learnings are easily, coherently and consistently populated across the various DNO planning and operations systems in which they are required.

A related problem is that there is currently no way to estimate the demand side response (DSR) potential available from the specific mix of customers at each distribution network asset to obtain an overview of the DSR capacity (from both domestic and commercial customers) under a variety of scenarios. As such, it is not possible to assess the costs and benefits of various DSR intervention options in relation to reinforcement deferral outcomes at individual network assets. To be able to make informed decisions on DSR priorities, and to effectively utilise the findings of various DSR trials to date, it is necessary to develop a tool that is able to map domestic and commercial DSR potential at a substation level for a variety of scenarios and to relate this to the capacity and forecast loading levels at each of these substations. Such a tool would also need to be able to take account of DSR opportunities created by current and forecast levels of LCT uptake in line with the LCT load scenario system described above.

Finally, there is an increasing need for LCT uptake and load forecasting that is resolved to the individual secondary substation level and that is able to take into account the consumption and technology adoption behaviours that are unique to the mix of specific customers connected to each secondary substation. It is, therefore, necessary to expand Northern Powergrid's load forecasting and LCT uptake systems to be able to resolve future loads and technology impacts at this higher level of asset resolution for a variety of future scenarios and to relate this to the relevant substation capacity and DSR opportunities available.

Method(s)

This project is designed to address the prediction and modelling challenges described through the development of an improved computational modelling and forecasting process across the following five work packages:

Work Package 1: New scenarios for improved planning consistency and accuracy

Work Package 2: Integrating LCNF and other UK trial learnings

Work Package 3: Demand Side Response potential at substation level

Work Package 4: Additional analysis of electric vehicle deployment and charging requirements

Work Package 5: Secondary substation peak load growth data

Scope

The scope of this project includes enhancements to the desktop load forecasting model that Element Energy previously developed for Northern Powergrid, along with a suite of new desktop modelling tools, to provide more accurate technology uptake and load forecasting for GSP, primary and secondary substations across the Northern Powergrid licence areas.

While the scope of this project will include the provision of consistent low carbon technology uptake forecasts to Northern Powergrid's broader business planning and operations systems, changes to the fundamental approach and functionality of these other systems are out of scope.

Objective(s)

The objectives of this project are:

1. To develop a LCT uptake forecasting tool that is easily updated (using automation algorithms where possible) with the latest uptake drivers (e.g. technology costs, policy incentives, consumer perceptions, hassle factors and other social and economic drivers).
2. To integrate the latest innovation learnings from various LCNF and other UK technology and customer monitoring trials into the LCT uptake forecasting tool as well as the Element Energy load forecasting model.
3. To develop a tool for mapping DSR potential to, tested against each substation in the Northern Powergrid, network based on the unique mix of domestic, commercial and industrial customers connected to each substation.
4. To create a high resolution, short-time step early warning system for EV deployment triggers.
5. To increase the resolution of the Element Energy load forecasting model to secondary substation level.
6. To share the learning developed through this project with other DNOs to allow integration of the new approaches into their own models.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will be considered successful if the aforementioned objectives are realised.

In addition to meeting the objectives listed above, the tools and models developed in this project will be assessed against the following success criteria:

1. They are able to efficiently transfer required outputs and datasets between each other and the broader business planning systems to which they are providing forecast data.
2. The new outputs produced are able to contribute significantly to new planning insights around forecast loads and reinforcement deferral options.

Where the tools are intended to be regularly updated, that this can be accomplished in a time-efficient and robust manner.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

Small-scale. Desktop study relevant to all Northern Powergrid and other DNO licence areas

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

Desktop study relevant to all Northern Powergrid and other DNO licence areas

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£118, 500

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

n/a

How the Project has potential to benefit consumer in vulnerable situations:

n/a

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

The increased accuracy, resolution, timeliness and visibility of future network loads will enable the business to better target network capacity and investments, conferring significant savings by ensuring only necessary reinforcement work is carried out and thereby minimising the economic and environmental impact of the networks. Improved asset level mapping of DSR impacts from various strategies, which is correlated with substation capacity and projected loads, will also offer large savings opportunities arising from more accurate evaluation of different reinforcement deferral options and the costs and benefits thereof at each network asset. We estimate a possible saving across the entire GB network of £20m.

Please provide a calculation of the expected benefits the Solution

As outlined in the business plan for the RIIO-ED1 period, Northern Powergrid expenditure on reinforcing the network between 2015 and 2023 is planned to be £150m. The tools and outputs developed in this project will provide direct evidence to ensure that this is invested as efficiently as possible. The tools will also help to accurately target various elements of the planned £139m expenditure (between 2015 and 2023) on investment to facilitate low carbon technologies on the network. While it is not possible to quantify the exact level of cost savings facilitated by the tools developed in this project at this stage, the inititial TRL being at the research level of 3, it is recognised that if successfully applied across the entire Northern Powergrid network, a 0.5 – 1% improvement in network planning and investment efficiency might be possible and achieve additional savings, over the current (ie base cost) approach, of £1.5 - £2.9m. Furthermore, the outputs of this project will provide the information required to better quantify these savings opportunities if applied more broadly across GB by other Network Licensees.

Please provide an estimate of how replicable the Method is across GB

The method is entirely compatible with all parts of the GB network.

Please provide an outline of the costs of rolling out the Method across GB.

This is currently difficult to assess but would probably be below £500k. Embodiments of the poutput are likely to be softwar enabled decision tools and no large scale capital roll-out is required.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☑ A specific novel operational practice directly related to the operation of the Network Licensees system

☑ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☐ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

The learnings, operational practices and commercial insights that will be developed in this project are applicable to all GB network licensees.

The increased insights around low carbon technology deployment and consumption patterns, asset resolved DSR potential, and the impact of these on various licensee business functions, operational practices and commercial arrangements can be robustly applied by other GB DNOs to achieve similar benefits to those identified from this project. Similarly, the innovation project datasets (covering LCT load profiles, smart meter data, time-of-use tariff impacts, etc.) are equally relevant to other GB DNOs, as is the ability to combine and utilise these datasets in their various business planning systems.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

This project addresses the specific challenges outlined in the "Modelling the network to improve planning" section of the Northern Powergrid innovation strategy document and the broader commitments to creating a smarter powergrid.

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

n/a

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

n/a

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

n/a

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

n/a

This project has been approved by a senior member of staff

☑ Yes